

REMARKS

The Office Action mailed November 9, 2001, has been received and reviewed. Claims 7, 8, 15, 16, 25 through 31, 38 through 44, 46 through 51, and 57 through 61 are currently pending in the application. Claims 7, 8, 15, 16, 25 through 31, 38 through 44, 46 through 51, and 57 through 61 stand rejected. Applicants have amended claims 7, 15, 46 and 57, and respectfully request reconsideration of the application as amended herein.

35 U.S.C. § 112 and §132 Claim Rejections

The amendment filed August 20, 2001, was objected to under 35 U.S.C. § 132 as allegedly introducing new matter into the disclosure. Claims 15, 16, 29, 38 through 44, 51, and 57 through 61 stand rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Specifically, claims 15, 29, 51, and 57 were rejected as the original disclosure allegedly does not support the limitation wherein the conductive material comprises both a generally planar first surface and a height to width ratio of at least approximately 3 to 1. Claims 38 through 40, 42 and 58 through 61 were rejected as the original disclosure allegedly failed to support any limitation of these claims. Applicants respectfully traverse this rejection, as hereinafter set forth.

Applicants respectfully submit that the limitations recited in claims 15, 29, 51, and 57 do not constitute new matter. Applicants note that previous citations to the specification were inaccurate and have corrected the citations herein. Applicants respectfully submit that the present invention is directed to viscous adhesive material including a generally planar surface. (*See, for example, Specification*, page 3, lines 19-21). Further, the figures illustrate that the method of the present invention generates viscous adhesive material including a generally planar surface while known methods create adhesive material that sag, spread or flow under the force of gravity. (*Specification*, page 3, lines 22-29 through page 4, lines 1-23; FIGS. 26-29; *compare, for example*, FIGS. 3, 5, 8, 11, 15-17, and 22 with FIGS. 26, 27, 29, 31, 32, 35, and 36). The specification clearly conveys that

known methods lead to viscous adhesive material lacking a substantially planar surface (FIGS. 26, 27, 29, 31, 32, 35, and 36) and the present invention addresses this deficiency. Thus, one of skill in the art would understand that all components created with the viscous adhesive material of the present invention may include a generally planar surface.

Similarly, the present application provides support for viscous adhesive material having a height to width ratio of the preferred target of 3:1 or greater. (See, for example, Specification, page 8, line 29 through page 9, line 2; page 16, lines 13-28). Specifically, the specification and figures describe conductive polymer bumps having generally planar upper surfaces and identify a preferred target of 3:1 or greater. (See, FIG. 43 and Specification, page 8, line 29 through page 9 line 2; page 16, lines 13-29). FIG. 43 depicts conductive polymer bumps having a substantially planar surface and the specification states, with respect to FIG. 43:

The conductive polymer bumps 1002 are generally made from material which is sufficiently viscous that minimal material flow occurs when the print screen or stencil 1010 is removed. However, this self-minimization of flow is only applicable to specific limited ratios of height to width of the conductive polymer bumps 1002. If the height of the conductive polymer bump 1002 is too great relative to the width, the weight of the conductive material will cause the conductive polymer bump 1002 to collapse on itself and flow laterally. Thus, **height to width ratios approaching the preferred target of 3:1 or greater obtainable with solder bumps are unattainable with present methods.**

(Specification, page 8-9, lines 22-2). The Specification further provides that according to the present invention, "the conductive polymer bumps can achieve height to width ratios of the preferred target of 3:1 or greater". (Specification, page 16, lines 24-27). Thus, one of skill in the art would understand that viscous adhesive material of the present invention may include both a generally planar surface as well as a height to width ratio of the preferred target of 3:1 or greater.

Applicants respectfully submit that the specification need not recite the claim limitations *ipsis verbis* in order to satisfy the written description requirements of 35 U.S.C. §112. *Fujikawa v. Wattanasin*, 93 F.3d 1559, 39 USPQ2d 1895 (Fed. Cir. 1996). The specification and drawings provide support for the limitations of claims 15, 29, 51, 52 and 57, which recite limitations of viscous adhesive material exhibiting a height-to-width ratio of at least approximately 3 to 1 and

including a first surface adjacent said flip-chip and a second surface opposite said first surface exhibiting a generally planar portion.

Similarly, applicants submit that one of skill in the art would understand the teachings and disclosure of the specification may be combined as recited in dependent claims 16, 38 through 44, and 58 through 61. Support for claim 16 can be found, for example, in claim 8. Support for claims 38 through 40 and 59 through 61 may be found, for example, on pages 12-13, lines 10-24, of the specification. Support for claims 41, 42 and 58 may be found, for example, on page 12, lines 10-15 of the specification. Support for claim 43 and 44 may be found, for example, in claims 30 and 31. Accordingly, applicants respectfully submit that the disclosure reasonably conveyed the presently claimed invention to persons skilled in the art. Reconsideration and withdrawal of the objection and rejection is requested.

Claims 15, 16, 29, 38 through 44, 51, 57 through 61 stand rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Applicants respectfully traverse this rejection, as hereinafter set forth.

35 U.S.C. § 102(a) Anticipation Rejections

Anticipation Rejection Based on U.S. Patent No. 5,468,681 to Pasch

Claims 7, 8, 15, 16, 25 through 31, 38 through 44, 46 through 51, and 57 through 61 stand rejected under 35 U.S.C. § 102(a) as being anticipated by Pasch (U.S. Patent 5,468,681). Applicants respectfully traverse this rejection, as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Pasch teaches a method for interconnecting conductive substrates using an interposer having conductive plastic filled vias. An interposer 1810 is formed having a plurality of through holes 1812. The through holes 1812 are force filled with a conductive plastic material 1820. Excess plastic material 1825b is scraped flush with a bottom surface of the interposer 1810. The interposer 1810 is positioned over a substrate 1840 and globs of material 1825a are pressed against onto contact pads of the substrate 1840. This pressure causes excess plastic material 1825d to protrude out of the other side of the interposer 1810 (FIG. 18d). The other side of the interposer 1810, having plastic bumps 1825d, is pressed against a second substrate 1850.

By way of contrast, independent claim 7 of the presently claimed invention recites

A semiconductor substrate including at least one laterally unconstrained adhesive patch comprised of a viscous adhesive material, the at least one adhesive patch including a first surface adjacent and supported from beneath by said semiconductor substrate and a second, smaller exposed surface opposite said first surface exhibiting a generally planar portion over a substantial portion thereof, said semiconductor substrate including said at least one adhesive patch formed by: providing a semiconductor substrate; dispensing a viscous adhesive material on said semiconductor substrate; and inverting said semiconductor substrate without effecting substantial lateral confinement of said adhesive material and maintaining said semiconductor substrate in an inverted position at least until said viscous adhesive material sufficiently stabilizes so as to exhibit a desired stable shape and a lateral boundary defining sizes of said first and second surfaces of said at least one adhesive patch and wherein at least a substantial portion of said second, smaller surface of said adhesive patch exhibits a generally planar configuration and said size of said second, smaller surface is smaller than said size of said first surface." (Emphasis added)

Applicants respectfully submit that Pasch fails to teach every limitation of independent claim 7. For example, Pasch fails to teach "at least one laterally unconstrained adhesive patch comprised of a viscous adhesive material, the at least one adhesive patch including a first surface adjacent and supported from beneath by said semiconductor substrate." Instead, in Pasch, the conductive epoxy 1820 is confined within through holes 1812 of *interposer* 1812 and, in any case, is unsupported *from beneath* by interposer 1812. Further, Pasch fails to teach "at least one adhesive patch including a first surface adjacent . . . said semiconductor substrate and a second, smaller exposed surface

opposite said first surface exhibiting a generally planar portion over a substantial portion thereof." Instead, Pasch lacks any disclosure of the relative size of the surface of the globs. Similarly, FIGS. 18b-18e suggest that globs 1825a-1825e are substantially the same size and, if anything, glob 1825c, which is the only glob supported from beneath by a semiconductor die (or substrate) 1840 is smaller in lateral extent than glob 1825e. Pasch also fails to teach that glob 1825d includes a planar portion over a substantial portion thereof before substrate 1850, to which die 1840 is to be connected, is pressed against glob 1825d. Hence, there is no *exposed, smaller* second surface opposite a first surface *exhibiting a generally planar portion over a substantial portion thereof* with respect to any of the masses of conductive plastic material 1820. Moreover, it is noted that the columnar structures 1640 of FIG. 16 of Pasch do not exhibit planar second surfaces and are taught to be formed of copper (Col. 37, lines 34-35) rather than comprising an adhesive. As Pasch fails to teach every limitation of independent claim 7, applicants respectfully submit that claim 7 is not anticipated by Pasch. Reconsideration and withdrawal of the rejection is requested.

Claims 8 and 25 through 31 are each allowable over Pasch as depending, either directly or indirectly, from allowable independent claim 7.

Claim 26 is further allowable as Pasch fails to teach the structural limitation wherein the at least one adhesive patch comprises at least one lateral edge exhibiting an angle of repose of at least approximately 20 degrees. Instead, Pasch lacks any disclosure regarding the particular angle of repose of the globs.

Claim 27 is further allowable as Pasch fails to teach the structural limitation wherein said at least one adhesive patch comprises at least one trailing edge exhibiting an angle of repose of at least approximately 13 degrees. Instead, Pasch lacks any disclosure regarding the particular angle of repose of the globs.

Claim 28 is further allowable as Pasch fails to teach the structural limitation wherein said at least one adhesive patch comprises at least one leading edge exhibiting an angle of repose of at least approximately 20 degrees. Instead, Pasch lacks any disclosure regarding the particular angle of repose of the globs.

With respect to claims 26 through 27, Applicants note that Pasch fails to teach, in combination, the claimed *exposed* second surface *exhibiting a generally planar portion over a substantial portion thereof* in combination with the claimed angles of repose. In other words, Pasch may teach the sagging under gravity of a conductive plastic, but nothing more. In addition, the claimed angles of repose do not appear to Applicants to be inherent in the Pasch structure.

Claim 29 is further allowable as Pasch fails to teach the structural limitation wherein said at least one *laterally unconstrained* adhesive patch comprises a height-to-width ratio of at least approximately 3 to 1. Instead, Pasch lacks any disclosure of the height-to-width ratio of the globs and, even assuming *arguendo* that the Pasch globs exhibit a 3 to 1 height-to-width ratio, they are not laterally unconstrained.

By way of contrast with Pasch, independent claim 15 recites

A flip-chip including at least one laterally unconstrained conductive bump comprised of a viscous conductive material, the at least one conductive bump exhibiting a height-to-width ratio of at least approximately 3 to 1 and including a first surface adjacent and supported from beneath by said flip-chip and a second exposed surface opposite said first surface exhibiting a generally planar portion over a substantial portion thereof, said flip chip including said at least one conductive bump formed by providing said flip-chip with at least one bond pad; dispensing a viscous conductive material on said flip-chip to define at least one conductive bump of a selected configuration exhibiting a height-to-width ratio of at least approximately 3 to 1, said at least one conductive bump in electrical communication with said at least one bond pad of said flip-chip and including a first surface adjacent said flip-chip and a second surface opposite said first surface; and inverting said flip-chip without substantial lateral confinement of said viscous conductive material and maintaining said flip-chip in an inverted position at least until said conductive material substantially stabilizes so as to exhibit a desired stable shape and lateral boundary substantially defining sizes of said first and second surfaces of said at least conductive bump and wherein a substantial portion of said second surface of said conductive bump exhibits a generally planar configuration. (Emphasis added)

Applicants respectfully submit that Pasch fails to teach every limitation of claim 15, for the same reasons as discussed above with respect to claim 7. Pasch fails to teach “at least one laterally unconstrained conductive bump comprised of a viscous conductive material.” Instead, Pasch discloses conductive epoxy 1820 confined within through holes 1812. Further, Pasch fails to teach

at least one laterally unconstrained conductive bump exhibiting a height-to-width ratio of at least approximately 3 to 1. In addition, Pasch lacks any disclosure of the height-to-width ratio of the globs 1825a-1825e. Also, Pasch fails to teach a second exposed surface opposite said first surface exhibiting a generally planar portion over a substantial portion thereof. As Pasch fails to teach every limitation of independent claim 15, applicants respectfully submit that claim 15 is not anticipated by Pasch. Reconsideration and withdrawal of the rejection is requested.

Claims 16 and 38 through 44 are each allowable over Pasch as depending, either directly or indirectly, from allowable independent claim 15.

Claim 38 is further allowable as Pasch fails to teach the structural limitation wherein the at least one conductive bump comprises at least one lateral edge exhibiting an angle of repose of at least approximately 20 degrees. Instead, Pasch lacks any disclosure regarding the particular angle of repose of the globs.

Claim 39 is further allowable as Pasch fails to teach the structural limitation wherein said at least one conductive bump comprises at least one trailing edge exhibiting an angle of repose of at least approximately 12 degrees. Instead, Pasch lacks any disclosure regarding the particular angle of repose of the globs.

Claim 40 is further allowable as Pasch fails to teach the structural limitation wherein said at least one conductive bump comprises at least one leading edge exhibiting an angle of repose of at least approximately 20 degrees. Instead, Pasch lacks any disclosure regarding the particular angle of repose of the globs.

With respect to claims 38 through 40, Applicants again note that Pasch fails to teach, in combination, the claimed *exposed* second surface *exhibiting a generally planar portion over a substantial portion thereof in combination with* the claimed angles of repose. In other words, Pasch may teach the sagging under gravity of a conductive plastic, but nothing more. In addition, the claimed angles of repose do not appear to Applicants to be inherent in the Pasch structure.

By way of contrast with Pasch, independent claim 46 recites

A semiconductor substrate including at least one laterally unconstrained adhesive patch comprised of a viscous adhesive material, the at least one adhesive patch

including a first surface adjacent and supported from beneath by said semiconductor substrate and a second, smaller exposed surface opposite said first surface, said second smaller, exposed surface exhibiting a generally planar portion over a substantial portion thereof. (Emphasis added)

Applicants respectfully submit that Pasch fails to teach every limitation of independent claim 46 for the same reasons set forth above with respect to claim 7 and is therefore not anticipated by Pasch. Reconsideration and withdrawal of the rejection is requested.

Claims 47 through 51 are each allowable as depending, either directly or indirectly, from allowable claim 46.

Claim 48 is further allowable as Pasch fails to teach wherein said at least one adhesive patch comprises at least one lateral edge exhibiting an angle of repose of at least approximately 20 degrees. Instead, Pasch lacks any disclosure of the particular angle of repose of the globs.

Claim 49 is further allowable as Pasch fails to teach wherein said at least one adhesive patch comprises at least one trailing edge exhibiting an angle of repose of at least approximately 13 degrees. Instead, Pasch lacks any disclosure of the particular angle of repose of the globs.

Claim 50 is further allowable as Pasch fails to teach wherein said at least one adhesive patch comprises at least one leading edge exhibiting an angle of repose of at least approximately 20 degrees. Instead, Pasch lacks any disclosure of the particular angle of repose of the globs.

With respect to claims 48 through 50, Applicants again note that Pasch fails to teach, in combination, the claimed *exposed* second surface *exhibiting a generally planar portion over a substantial portion thereof* in combination with the claimed angles of repose. In other words, Pasch may teach the sagging under gravity of a conductive plastic, but nothing more. In addition, the claimed angles of repose do not appear to Applicants to be inherent in the Pasch structure.

Claim 51 is further allowable as Pasch fails to teach wherein said at least one *laterally unconstrained* adhesive patch exhibits a height-to-width ratio of at least approximately 3 to 1. Instead, Pasch lacks any disclosure of the height-to-width ratio of the globs.

By way of contrast with Pasch, independent claim 57 recites

A flip-chip including at least one laterally unconstrained conductive bump comprised of a viscous conductive material, the at least one conductive bump exhibiting a height-to-width ratio of at least approximately 3 to 1 and including a first surface adjacent and supported from beneath by said flip-chip and a second exposed surface opposite said first surface, said second surface exhibiting a generally planar portion over a substantial portion thereof. (Emphasis added)

Applicants respectfully submit that Pasch fails to teach every limitation of independent claim 57 for the same reasons advanced previously with respect to claim 15 and is therefore not anticipated by Pasch. Reconsideration and withdrawal of the rejection is requested.

Claims 58 through 61 are each allowable as depending from allowable claim 57.

Claim 59 is further allowable as Pasch fails to teach wherein said at least one conductive bump comprises at least one lateral edge exhibiting an angle of repose of at least approximately 20 degrees. Instead, Pasch lacks any disclosure of the specific angle of repose of the globs.

Claim 60 is further allowable as Pasch fails to teach wherein said at least one conductive bump comprises at least one trailing edge exhibiting an angle of repose of at least approximately 13 degrees. Instead, Pasch lacks any disclosure of the specific angle of repose of the globs.

Claim 61 is further allowable as Pasch fails to teach wherein said at least one conductive bump comprises at least one leading edge exhibiting an angle of repose of at least approximately 20 degrees. Instead, Pasch lacks any disclosure of the specific angle of repose of the globs.

With respect to claims 59 through 61, Applicants again note that Pasch fails to teach, in combination, the claimed *exposed* second surface *exhibiting a generally planar portion over a substantial portion thereof* in combination with the claimed angles of repose. In other words, Pasch may teach the sagging under gravity of a conductive plastic, but nothing more. In addition, the claimed angles of repose do not appear to Applicants to be inherent in the Pasch structure.

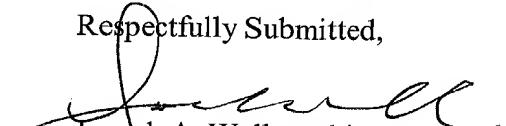
ENTRY OF AMENDMENTS

Applicants respectfully assert that the present amendments to claims 7, 15, 46 and 57 are supported by the disclosure as originally filed and, therefore, do not introduce new matter.

CONCLUSION

Claims 7, 8, 15, 16, 25 through 31, 38 through 44, 46 through 51, and 57 through 61 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

Respectfully Submitted,


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Date: March 11, 2002

Enclosure: Version With Markings to Show Changes Made

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